US 20080105481A1

(19) United States

(12) Patent Application Publication

(10) Pub. No.: US 2008/0105481 A1

(43) Pub. Date: May 8, 2008

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(54) **RECONFIGURABLE BALANCING ROBOT AND METHOD FOR DYNAMICALLY TRANSITIONING BETWEEN STATICALLY STABLE MODE AND DYNAMICALLY BALANCED MODE**

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(21) Appl. No.: **11/591,925**

(22) Filed: **Nov. 2, 2006**

Publication Classification

(51) **Int. Cl.**
B62D 61/12 (2006.01)
B25J 18/00 (2006.01)
G06F 19/00 (2006.01)

(52) **U.S. Cl.** **180/209**; 74/490.05; 700/245; 901/1; 901/27; 901/30

(57) **ABSTRACT**

An apparatus and a method for robotic control that allows an unbalanced pendulum robot to raise its Center of Mass and balance on two motorized wheels. The robot includes a pair of arms that are connected to the upper body of the robot through motorized joints. The method consists of a series of movements employing the arms of the robot to raise the robot to the upright position. The method comprises a control loop in which the motorized drives are included for dynamic balance of the robot and the control of the arm apparatus. The robot is first configured as a low Center of Mass four-wheeled vehicle, then its Center of Mass is raised using a combination of its wheels and the joint located at the attachment point of the arm apparatus and the robot body, between the rear and front wheels; the method then applies accelerations to the rear wheels to dynamically pivot and further raise the Center of Mass up and over the main drive wheels bringing the robot into a balancing pendulum configuration.